to 50 gf or more per bump.

According to the fourth embodiment, the metal bumps 3 and the metal plating of the board 4 are subjected to metallic diffusion bonding, and this arrangement is therefore appropriate for giving a strength to each bump portion or further reducing the connection resistance value.

(Fifth Embodiment)

A method and apparatus for mounting an electronic component of, for example, an IC chip on a circuit board and an electronic component unit or module of, for example, a semiconductor device in which the IC chip is mounted on the board by the mounting method, according to a fifth embodiment of the present invention will be described next with reference to Fig. 8A through Fig. 8C and Fig. 9A through Fig. 9C. The fifth embodiment differs from the first embodiment in that the encapsulation process can be eliminated.

As described above, the protruding electrodes (bumps) 3 are preparatorily formed on the electrodes 2 of the IC chip 1. On the circuit board 4, as shown in Fig. 8B, Fig. 8C, Fig. 9A and Fig. 23, a rectangular sheet-shaped anisotropic conductive film sheet 10 or a thermosetting adhesive 6b that has a configurational dimension smaller than an approximately rectangle-shaped outline dimension OL defined by joining the inner edges of the plurality of

electrodes 2 of the IC chip 1 is preparatorily stuck or applied to a center portion of a region defined by joining the electrodes 5 of the circuit board 4. At this time, the thickness of the sheet-shaped anisotropic conductive film sheet 10 or the thermosetting adhesive 6b is set so that its volume becomes slightly greater than a gap between the IC chip 1 and the board 4. By means of the sticking device 640 of Fig. 23, a rectangular sheet-shaped anisotropic conductive film sheet 656 that is rewound from a rewinding roll 644 and wound around a winding roll 643 is cut along a portion preliminarily provided with a notch 657 by upper and lower cutter blades 641 into a configurational dimension smaller than the approximately rectangle-shaped outline dimension OL defined by joining the inner edges of the plurality of electrodes 2 of the IC chip 1. The anisotropic conductive film sheet 10 cut in the rectangular sheet-like shape is sucked and held by a sticking head 642 pre-heated by a built-in heater 646 and stuck to the center portion of the region defined by joining the electrodes 5 of the circuit board 4. Next, the bumps 3 and the electrodes 5 of the circuit board 4 are aligned in position and, as shown in Fig. 8A and Fig. 9B, the IC chip 1 is pressurized with a pressure against the circuit board 4 by the heating tool 8 heated by the heater 8a so as to concurrently perform the correction of the warp of the

board 4 and harden the anisotropic conductive film sheet 10 or the thermosetting adhesive 6b interposed between the IC chip 1 and the circuit board 4. At this time, the anisotropic conductive film sheet 10 or the thermosetting adhesive 6b is softened as described hereinabove by the heat applied from the bonding tool 8 via the IC chip 1 and flows outward by being pressurized from the position to which it has been stuck or applied as shown in Fig. 9C. This outflow anisotropic conductive film sheet 10 or thermosetting adhesive 6b becomes an encapsulation material (underfill), which remarkably improves the reliability of the bonding of the bumps 3 to the electrodes 5. After a lapse of a specified time, the hardening of the anisotropic conductive film sheet 10 or the thermosetting adhesive 6b gradually progresses, and the hardened resin 6s finally bonds the IC chip 1 to the circuit board 4. By moving up the bonding tool 8 that is pressurizing the IC chip 1, the bonding of the IC chip 1 to the electrodes 5 of the circuit board 4 is completed. Strictly speaking, in the case of thermosetting, the reaction of the thermosetting resin progresses during heating, and the fluidity almost disappears with the moving-up motion of the bonding tool 8. According to the above-mentioned method, neither the anisotropic conductive film sheet 10 nor the thermosetting adhesive 6b covers the electrodes 5 before bonding, and